CLAIMS

1. A method of forming a composite, comprising:
providing a strand comprising a plurality of fibers;
exposing the strand to a stable emulsion comprising polymer particles; and
allowing the particles polymer particles to penetrate gaps between individual fibers.

2. The method of claim 1, wherein the penetration occurs to the extent that polymer particles substantially fill gaps between the individual fibers of the strand.

3. The method of claim 2, further comprising the step of fusing the polymer particles to provide a polymer matrix embedding the individual fibers of the strand.

4. The method of claim 3, wherein the fusing step comprises applying an elevated temperature to the particles.

5. The method of claim 4, wherein the elevated temperature is greater than a minimum film-forming temperature.

6. The method of claim 3, wherein the fusing step comprises applying a pressure to the particles.

7. The method of claim 6, wherein the pressure is no more than about 1750 kPa.

8. The method of claim 6, wherein the pressure is at least about 350 kPa.

9. The method of claim 1, further comprising the step of drying the particles below a minimum film-forming temperature.

10. The method of claim 1, further comprising the step of repeating the exposing step at least once.

11. The method of claim 1, wherein the emulsion comprises polymer particles in water.

12. The method of claim 1, wherein the emulsion further comprises a surfactant.

13. The method of claim 1, wherein the emulsion has a solids content of no more than about 60%.

14. The method of claim 1, wherein the emulsion has a solids content of no more than about 50%.

15. The method of claim 1, wherein the emulsion has a solids content from about 5% polymer particles to about 60%.

16. The method of claim 1, wherein the emulsion has a solids content from about 5% polymer particles to about 50%.

17. The method of claim 1, wherein the polymer particles have a mean diameter of no more than about 0.25 times the fiber diameter.

18. The method of claim 1, wherein the polymer particles have a mean diameter of no more than about 5 μm.

19. An article, comprising:

a mixture comprising fibrous segments and polymer particles, a portion of the particles penetrating substantially all ends of individual fibers in the fibrous segments, and the entire article being substantially rigid.

20. The article of claim 19, wherein the article is a prepreg.

21. The article of claim 19, further comprising a plurality of porous segments wherein a portion of polymer particles substantially fill pores of the porous segments.

22. The article of claim 19, further comprising non-porous and non-fibrous fillers.

23. A composite, comprising outer layers of a fibrous sheet sandwiching a core comprising the article of claim 19.

24. A composite, comprising a layer of a fibrous sheet enclosing a core comprising the article of claim 19.

25. A composite, comprising:

a plurality of fibrous segments; and

a polymer matrix embedding the fibrous segments and ends of individual fibers of the fibrous segments.

26. The composite of claim 25, wherein the polymer matrix embedding the fibrous segments comprises a core, the composite further comprising outer layers of a fibrous sheet sandwiching the core.

27. The composite of claim 25, wherein the polymer matrix embedding the fibrous segments comprises a core, the composite further comprising an outer layer of a fibrous sheet enclosing the core.